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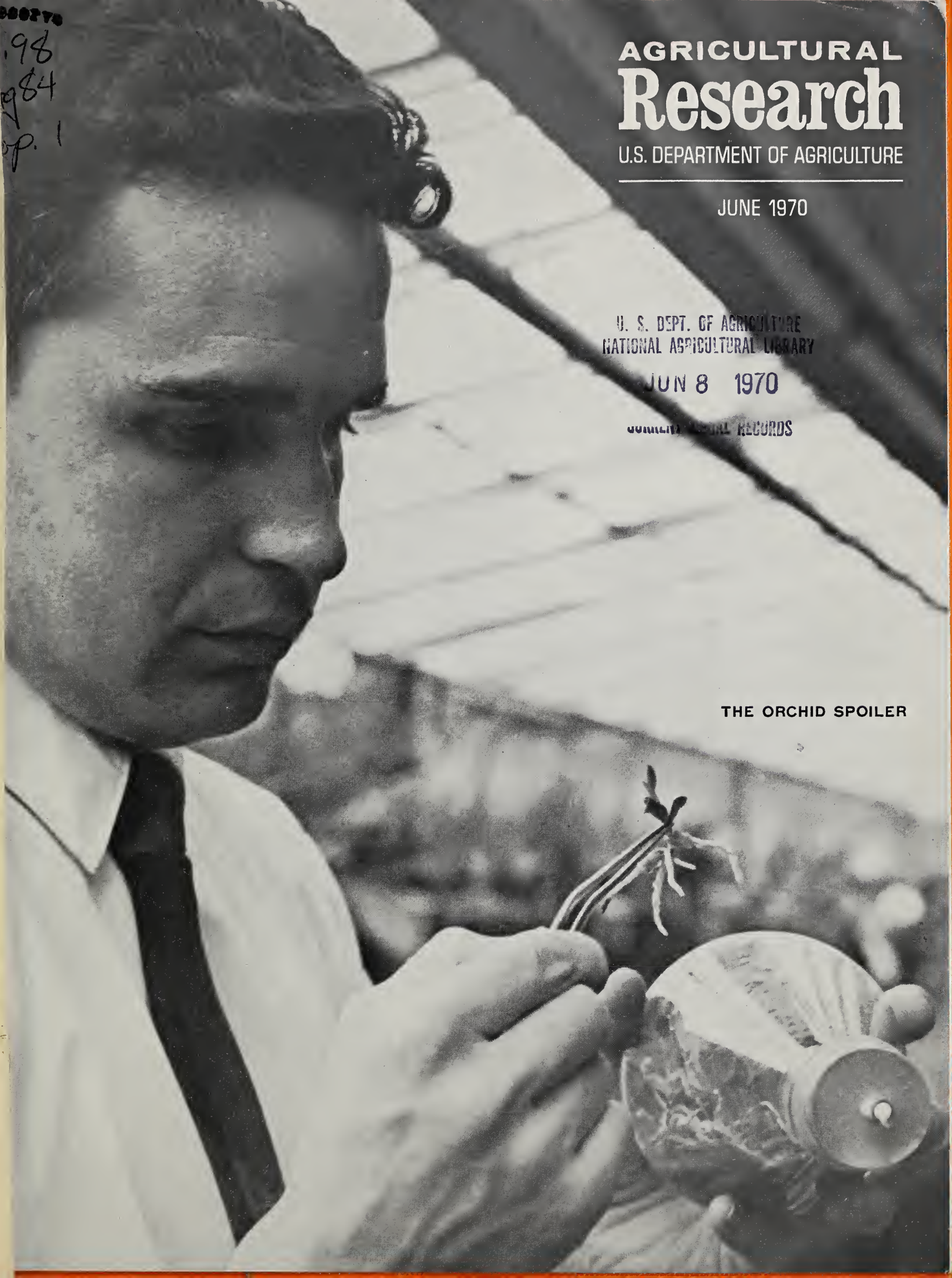
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THE ORCHID SPOILER

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Research

June 1970/Vol. 18, No. 12

Biological Control Comes Hard

Insect fighters recently achieved an important victory over the alfalfa weevil. Their weapon: Fragile wasps that parasitize weevil larvae but pose no hazard to other life forms or the environment. Significantly, the wasps provided low-cost control over a 3-year test period (p. 3).

Successful biological control comes hard. First entomologists must engage in a global insect safari to track down the desired natural enemies. This is an overwhelming task in a world populated by at least 2 million species of insects. Moreover, unlike their colleagues in such fields as chemistry, entomologists often lack an adequate inventory of their basic working materials. For example, the *Ichneumonidae,* a useful family of the order including ants, wasps, and bees numbers over 60,000 species, of which only 15,000 have been classified.

After collecting a foreign insect-eating species, scientists must run rigorous and time-consuming studies to determine that it can adapt to its new environment and that it will attack only the target species. Next, scientists must devise economical ways to culture and often mass-produce the candidate species for release. In still other projects, they must determine how to synchronize the life cycles of biotic agent and pest, study the ecological relationships between the pest and the crop it attacks, and much more. All this requires trained manpower, money, time, and dedication.

A dozen years ago biological control research around the world was at low ebb; pesticides were in the ascendency. But scientists were already aware that insects were becoming resistant to once potent pesticides. At the same time scientists and the public were becoming concerned about pesticide residues. Now the situation is reversed. While pesticides continue in important and general use, the research emphasis has shifted to alternate methods of pest control.

We have scarcely begun to exploit the potential for biological control. Biotic agents will someday control certain pests; other agents will be integrated with various control methods tailored to the circumstances. Certainly parasites, predators, and pathogens will be vital allies in man's incessant war on insect pests.

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Clifford M. Hardin, Secretary
U.S. Department of Agriculture

G. W. Irving, Jr., Administrator
Agricultural Research Service



A wasp parasite deposits eggs in one of the alfalfa weevil larvae. Eggs hatch within the host, then kill it (PN–1881).

A biological control triumph . . . WASPS vs. ALFALFA WEEVILS

Many entomologists recognize the limitations of biological agents in the control of insects attacking crops. Too often, introduced parasites do not become established or are not effective enough to obviate the need for other methods of control. That's what makes the success of this project important—scientists have scored against a serious pest and reduced losses to a valuable crop by using a nonchemical method that creates no hazard to the environment.

TINY PARASITIC WASPS are hitting alfalfa weevils as effectively as conventional insecticides. Last year, for example, they saved farmers in three test areas more than $600,000.

ARS entomologists headed by Marvin H. Brunson, at Moorestown, N.J., successfully established four species of wasps in the test areas. These wasps, which originated in Europe, are harmless to man. The New Jersey Department of Agriculture cooperated in the project.

Because their influence increases gradually, the wasps' significance has been difficult to pin down in periods much shorter than a decade. However, the test areas, encompassing 155,000 acres in New Jersey and Pennsylvania, provided ARS entomologist William H. Day with sufficient statistical data in the last 3 years to confirm theoretical control potentials predicted for the parasites.

In field studies in 1967, Dr. Day and ARS entomologist Roger W. Fuester captured about 40 weevil larvae per sweep of their insect nets during the year's peak infestation period. Of these larvae, only 9 percent were parasitized.

Last year's survey spelled success for the wasps. Only about five larvae were captured per sweep in the peak infestation period, and of these,



ARS entomologist Leon W. Coles sweeps New Jersey field with net in survey for weevil parasites (BN-34625).

39 percent were parasitized. These figures indicate about a 90 percent pest reduction in only 3 years. The experiments thus represent a successful biological control project that presents a very encouraging outlook for the future.

An important byproduct of this drastic curtailment of infestations was the reduced need for insecticides. Previous studies showed that when fewer than 15 larvae are captured per sweep, the damage caused by the pests would amount to less than farmers would spend in spraying.

Accordingly, entomologists in Delaware, New Jersey, New York, and Pennsylvania, began to find that fewer farmers in these States were applying insecticides against alfalfa weevils. For example, entomologist Stuart R. Race of Rutgers University Extension Service found that 94 percent of the New Jersey farmers surveyed had sprayed for the pests in 1967, but only 9 percent found it necessary to spray in 1969. Dr. Day calculated that the wasps saved farmers about $5 per acre—for insecticides, labor, and equipment otherwise needed to control the weevils.

The same wasp species most important in the test areas also appear to be the most active parasites of alfalfa weevils in all the Middle Atlantic States (AGR. RES., Oct. 1969, p. 10). Additional species are being studied to determine their control potential in other areas of the United States.

One species, *Peridesmia discus*, is from France and has been released in southern climates where its host—the weevils' eggs—survives winter in larger numbers than in the North. *P. discus* deposits its eggs in the midst of clusters of weevil eggs. Upon hatching, the wasp larvae then begin to consume the surrounding weevil eggs.

A second species, *Bathyplectes anurus*, common in Southern Europe, may show promise against weevil larvae in the Southeast. A third species, *B. stenostigma*, is found in Northern Europe and should be adapted to the cooler climate of the Northeast and North Central States.

With the introduction of these parasites and continued dispersal of those already abundant in New Jersey and adjacent areas, prospects are encouraging for eventual control of the weevil in most U.S. alfalfa-growing areas.

Reece I. Sailer, the entomologist who heads the ARS program on biological control of insects, points out that "in Europe, wasps have long held alfalfa weevils in check, and the Moorestown experiments suggest that the same natural system of biological control may work elsewhere in our country." ■

Indian-meal moth . . .

Stripped out of Stored Grain

INSECTICIDE-TREATED STRIPS that homemakers use to kill flies employ a principle that may also help farmers zero in on one of the more troublesome pests of stored grain—the Indian-meal moth.

The moths and their larvae are becoming harder to kill. At one time, malathion, one of the best insecticides for stored-grain pests, gave good control. However, in experiments at the Mid-West Grain Insects Laboratory, Manhattan, Kans., many progeny of moths from a wild strain survived in grain having malathion deposits as high as 40 parts per million—amounts five times greater than would be found under approved application rates. Logically, more moths would have had an even better chance to survive in grain possessing the lower, approved level of deposit.

But in related tests, ARS entomologist Delmon W. La Hue killed all adult Indian-meal moths within 24 hours with dichlorvos impregnated in strips made of a plastic resin, polyvinyl chloride. The inexpensive, 20-percent dichlorvos insecticide produced effective vapors for about 3 months.

Mr. La Hue suspended the strips from hooks above the top layer of bulk corn in regular and simulated bins at the rate of one strip per thousand cubic feet of air space. This experimental method of control is not registered by USDA for use in stored grain. However, large-scale field tests are underway to develop further information on effectiveness and safety.

The moths are particularly vulnerable to control by the vapor-generating strips. Most stored-grain pests are found throughout the grain mass, but the moths and their larvae are active mainly in the top 2 inches of grain and the air space above it.

Not only are the strips effective but unlike malathion and some other insecticides, they produce only short-lived residues in grain. Mr. La Hue found residues primarily in the top 2 inches of corn in the bins, and then only at rates of about 0.2 parts per million or less.

As with any control measure, the treated strips have certain limitations. If the strips get wet or are exposed to humid conditions, the dichlorvos decomposes. Moreover, low temperatures appreciably reduce the strips' effectiveness. However, there is little need for control measures in cold weather because moths are inactive then.

Preliminary tests indicate that dichlorvos vapors are more lethal to adult moths than to their larvae. Therefore, by applying the treated strips as soon as the grain is placed in storage, larval infestations may be prevented if the vapors kill the moths fast enough to prevent mating and egg-laying.

Other encouraging field-scale tests with dichlorvos-treated strips have been made on stored corn, grain sorghum, peanuts, and soybeans by researchers in Georgia, Illinois, Indiana, Kansas, Missouri, Nebraska and Ohio. ■

Moth mortality rate is determined after exposure to strips (BN–35876).



Mr. La Hue places cages containing different life stages of the moth in test area for exposure to vapors (BN–35875).





pinning down the ORCHID SPOILER

CYMBIDIUM MOSAIC VIRUS (CyMV) has been linked to flower necrosis disease in the popular cattleya orchid, a finding that may dispel much of the confusion and misinformation among commercial growers and amateur enthusiasts alike.

In the past few years, cattleya and other orchids along with the multimillion dollar industry that surrounds them have been adversely affected by virus-induced necrotic streaking, which destroys the beauty of affected flowers and causes early aging. Since flowers are harvested about 5 days after buds open and the disease symptoms most often appear after 12 to 14 days, the florist or the buying public often reap the results.

ARS plant pathologist Roger H. Lawson, who has been working with orchid viruses for over 4 years, has succeeded in separating tobacco mosaic virus (TMV–O), once thought a necessary part of the disease, from CyMV and from contaminating materials through a highly refined centrifuging procedure. By inoculating some orchid plants with pure TMV–O and others with CyMV, he found that CyMV is, without doubt, the culprit in flower necrosis disease. This firmly established for the first time that flower necrosis disease has a different cause than the similar color-breaking disease caused by the TMV–O.

There is yet no known treatment or cure for flower necrosis, however. Most growers have instituted sterile procedures for cutting flowers and dividing and potting plants to prevent virus transmission. Still to be overcome, says Dr. Lawson, is the widespread misconception that propagation with meristem cultures produces virus-free plants.

Meristem culture, a recent innovation, involves carefully removing the tiny piece of embryonic tissue, the meristem, which initiates all new growth in a plant—stem, leaves, and flowers—and planting the tissue on a sterile nutrient growing medium. This tiny piece of tissue proliferates and can be cut into further pieces, replanted on more nutrient medium, and on and on. Finally, many plantlets form, grow, and can be separated and potted. This new method allows growers for the first time to rapidly produce hundreds of new plants—all identical to their mother.

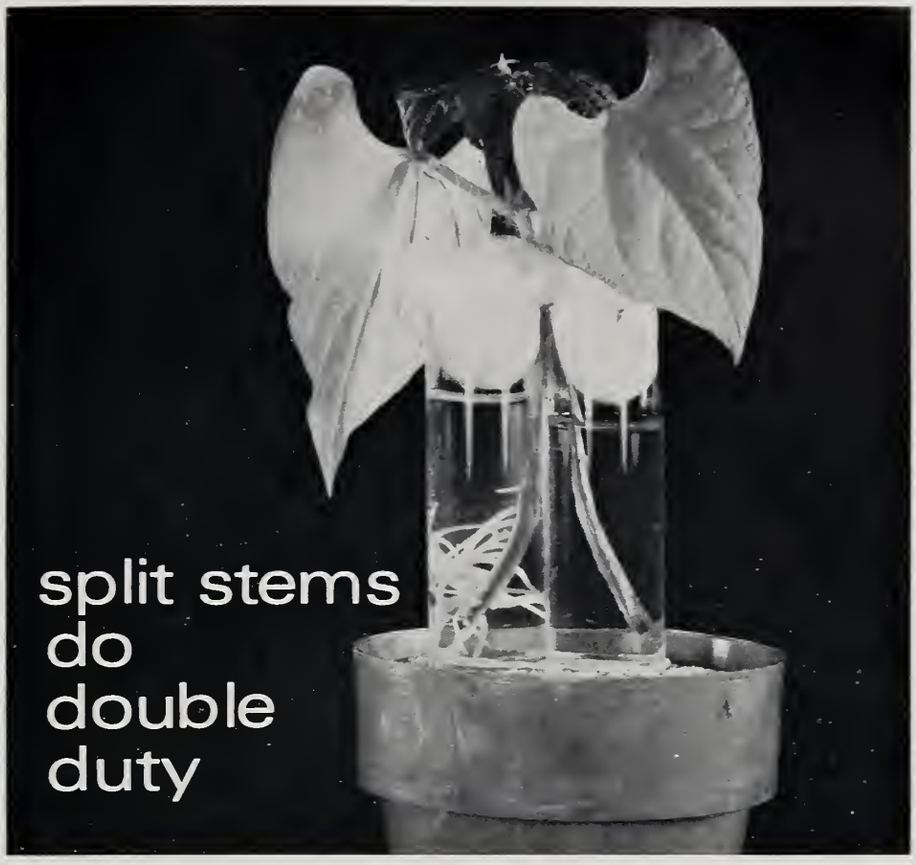
Because many orchid varieties may



Cover: Using sterile forceps, Dr. Lawson examines a 9-month-old cattleya plant that was grown by meristem culture (1269A289–3). Left: Dr. Lawson inspects a severely diseased cattleya orchid that shows the virus-induced streaking (1269A287–2). Above: Mr. Clive Atyeo, employed by a commercial orchid grower, prunes the roots of a cattleya orchid with shears that were sterilized in a flame (1269A289–19).

not show symptoms of CyMV in their foliage and generally flower from 4 to 6 years after meristem culture, Dr. Lawson stresses the importance of detecting viruses in mother plants before meristems are cultured. The diagnostic tools are available to the grower in the form of inexpensive test plants such as pigweed that show leaf symptoms when juice from an infected orchid plant is rubbed on them.

Although the disease is worldwide, many plants in the houses of commercial and amateur growers are not infected. Thus, emphasis can be placed on preventing the spread of viruses and on diagnosing and discontinuing the lines of diseased plants. In this way, the orchid can retain its unique position in the flower world as the ultimate in beauty and dignity.■



split stems do double duty

Stem halves of red kidney bean plant placed in separate tubes with herbicide (right) and without (PN–1874).

SPLITTING HAIRS doesn't help anyone, but splitting stems does. In fact, adaptation of the "split-stem technique" is providing a valuable new tool in studies on the behavior and effects of herbicides in plants.

The herbicide evaluation technique, developed by Walter A. Gentner, ARS plant physiologist at Beltsville, Md., is as reliable as other methods but is cheaper and much faster. It consists of splitting a plant stem so that one-half can be treated while the other, which has the same genetic makeup, serves as a control.

Dr. Gentner used pinto bean in his tests. When the plant was 18 to 21 days old or when root initials (bumps) appeared along the stem, the plant was cut off at ground level. He split the stem lengthwise from the bottom up about 3 inches, or half way, so that each stem half had two rows of root initials. The halves were inserted into separate test tubes—one containing herbicide and a nutrient solution and one containing the nutrient only.

After 72 to 96 hours the plant was ready for examination by comparing the stem halves. The effect of the herbicide on root growth was determined by comparing the length, weight, and number of root initials on each stem half. And the amount of injury, leaf color differences, subnormal cell expansion, and abnormalities in tissue revealed other herbicide effects.

Besides being useful in herbicide studies, the technique also may serve in evaluating growth stimulants and in studying root exudation of root- and foliar-applied systemic chemicals. It may also prove suitable in studying the relationship between size of herbicide molecules or other substances and rate of entrance and translocation in plants.■

PLANT MEMBRANES

Probing the gatekeeper's secrets

A FROG IN A POND, a tree in the soil, and a man walking on this planet earth—all are alive and functioning because of the special qualities of membranes. Without membranes, life as we know it could not exist.

Agriculture is concerned with the structure and function of membranes for an important reason. Plants can live only by taking materials up from the soil, and everything a plant takes up must pass through the membranes of root cells. Despite the reluctance of membranes to yield to the probing of scientists, some functions and structural features have been determined. A living membrane seems to be a double-layered structure composed of lipoproteins—oily molecules attached to protein molecules. There are also porous watery areas. Thus, a cell membrane might be compared to a plastic bag made of lipoproteins with scattered watery pinholes, or pores.

In pioneering research that has upset previous theories, ARS scientists have now determined how certain weak acids pass through a living cell membrane—information that may help to determine the effects of soil amendments and pollutants on plant growth.

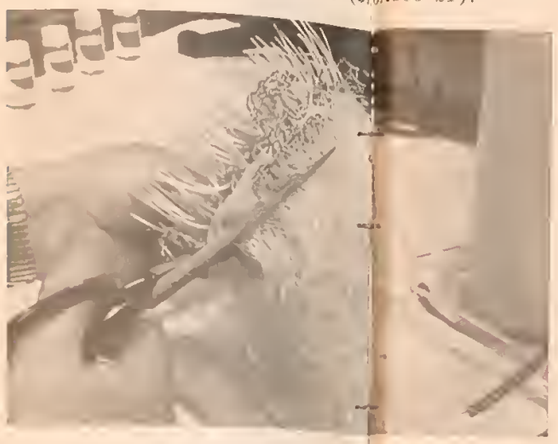
For many years, scientists assumed that weak acids pass through the membrane mainly as intact molecules that are absorbed into the oily areas of the membrane and from there released into the cell.

But in studies of living barley roots at Beltsville, Md., chemists Patricia C. Jackson and Sterling B. Hendricks and assistant John M. Taylor have shown that several common organic acids—formic, acetic, and others—mainly pass through the minute pores of the membrane and into the cell in an ionized form. When the organic acid molecules ionize, the positively charged hydrogen ion separates from the organic portion, which becomes negatively charged. Passage of the negative organic ion through the pores is the main way organic acids enter barley roots within the soil pH levels commonly tolerated by plants.

Even further, from the sizes and shapes of the organic acid ions that pass through the membrane pores, the scientists were able to estimate the approximate diameter of the pores—about 8 Angstrom units. In other words, it would take about 1 million pores, lying side by side like a string of beads, to stretch across the period at the end of this sentence. Interestingly, the pore size estimated by Mrs. Jackson and Dr. Hendricks agrees with pore sizes estimated by other scientists for animal membranes.

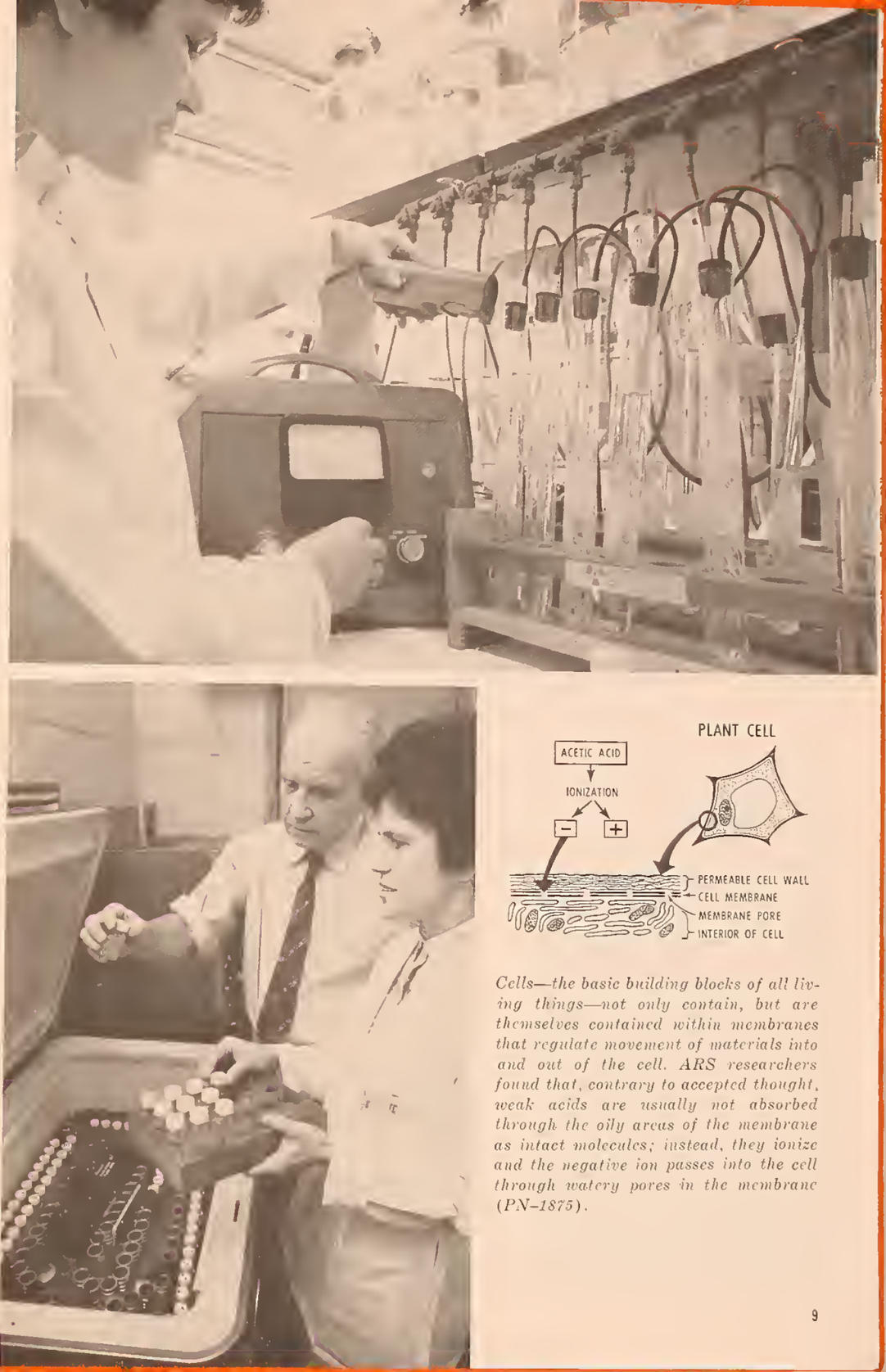
Despite this scientific triumph, much probing of the membrane remains to be done. As the secrets of living membranes are revealed, we can expect plants to be bred for highly specific membrane characteristics such as tolerance to varying or adverse soil conditions and to environmental pollution. Perhaps plants can even be bred with membranes that will reject disease organisms or their toxic byproducts. All this rests, however, on an understanding of cell membrane functions.■

Below: Roots are cut from 6-day-old seedlings into an aerated tray of water. They are then placed in tubes containing radioactive organic acids (370A186–25). Right: Mrs. Jackson uses radioactivity counter to monitor for leaks of radioactivity from tubes (370A186–21).



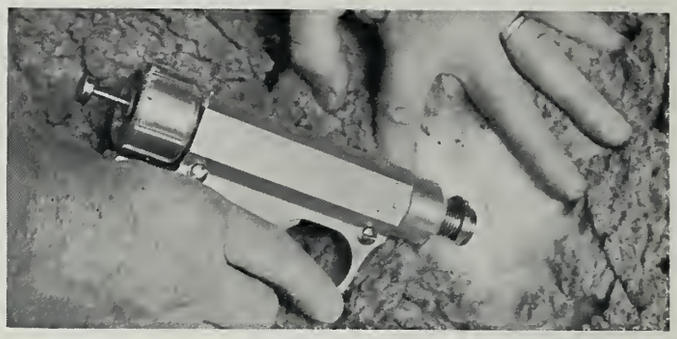


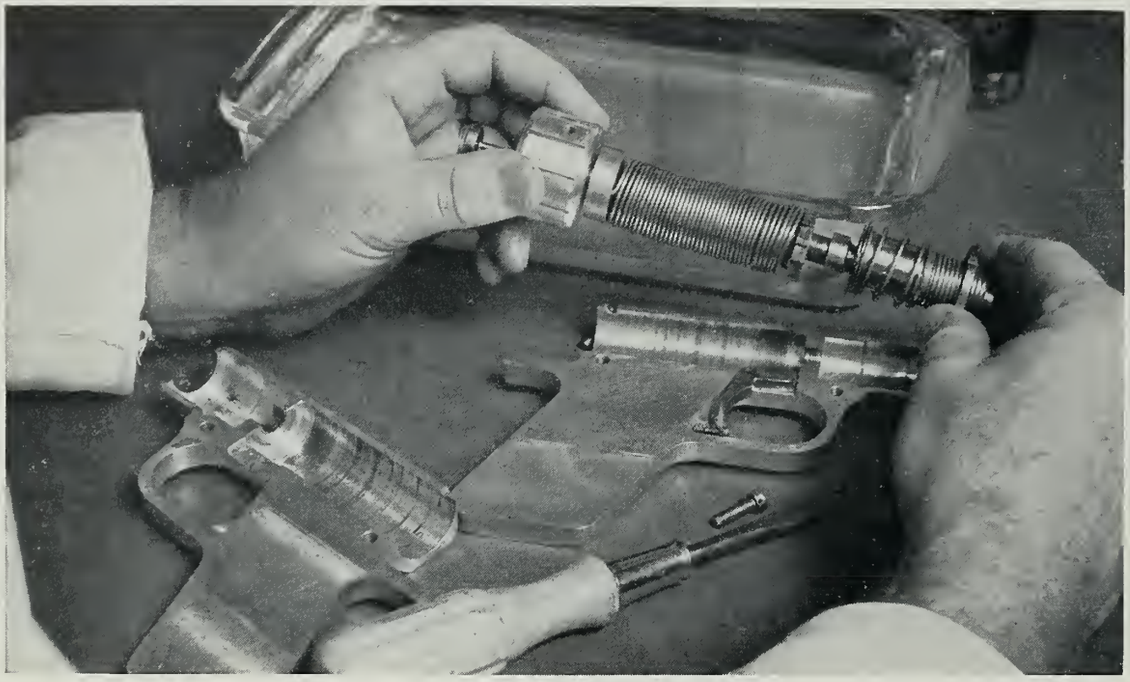
Above: Mrs. Jackson removes roots from tube and places them in vial (370A187–9). Right: Dr. Hendricks and Mrs. Jackson inspect radioactive roots in vial before placing in deep-freeze area of scintillation counter. The liquid in the vials has a slight luminescence in presence of radioactivity. Radioactivity in each vial is measured in counter and recorded on tape (370A186–7).



Cells—the basic building blocks of all living things—not only contain, but are themselves contained within membranes that regulate movement of materials into and out of the cell. ARS researchers found that, contrary to accepted thought, weak acids are usually not absorbed through the oily areas of the membrane as intact molecules; instead, they ionize and the negative ion passes into the cell through watery pores in the membrane (PN–1875).

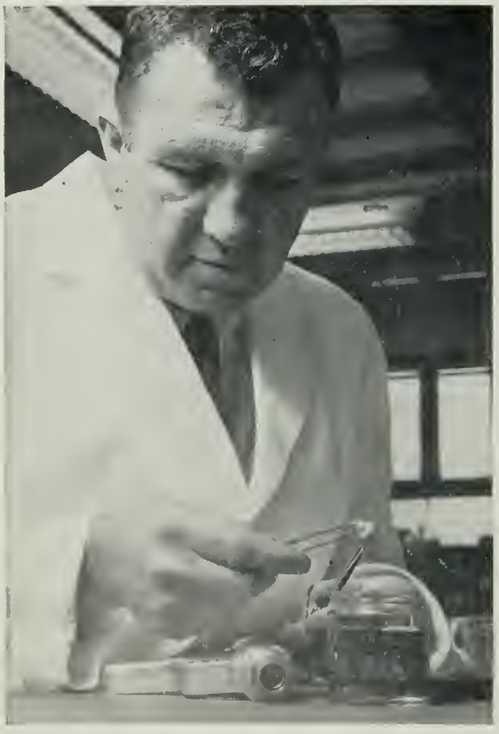
Right: *Wool is spread before sample is* taken *(0270A55–8).* ***Bottom right:*** *Biopsy sample is removed from gun by depressing plunger with thumb (0270A55–19).* ***Directly below:*** *Gun is disassembled by removing two screws. Here it is prepared for submersion in liquid sanitizer (0270A55–23).* ***Bottom:*** *Inventor of the gun, Mr. Schied holds biopsy sample taken from formaldehyde, a preservative (0270A55–2).*







Gun slices skin samples



A FAST DRAW isn't necessary to wield a new skin biopsy gun that is so easy to operate, an amateur can use it with little instruction.

Skin biopsy samples are taken for close study of tissue under a microscope. Before development of the gun, taking a biopsy sample was annoying at best. It required at least one man to hold the animal—more if it were a large animal—and another to make an incision with a scalpel to remove a section of skin. This method caused the animal to struggle, resulting in uneven skin samples.

ARS laboratory technician Robert J. Schied, Beltsville, Md., who developed the hand-operated gun, has used it successfully on sheep, cattle, mink and swine and found it a real labor-saver. One man can operate it if the animal is confined to a pen, and the wool or hair need only be parted, not clipped as is necessary for incisions with a scalpel.

The gun has a circular die with a sharp cutting edge that is attached to a spring wound inside the barrel. Pulling the trigger unwinds the spring, rotating the die. When the gun is placed against an animal's skin, the die cuts a circular section of tissue. The turning action of the die makes a clean cut and avoids tearing and stretching the skin. Dies can be adjusted to take different thicknesses of tissue and interchanged to cut different diameters.

Sterilizing the gun is a simple matter since it is constructed of aluminum and steel and can be immersed in a liquid sanitizer or placed in a regular sterilizer. It is easily disassembled and so simply constructed that there are few parts to wear out or break down.

The gun is not yet on the market.■

Backtracking diseased cattle through EAR IMPLANTS

A NEW livestock identificaton system under evaluation may aid animal health officials in locating the source of carcasses condemned by meat inspectors at the packing plant.

Rapid tracing of diseased animals to the herd of origin is imperative in preventing the spread of infectious diseases on farms and in locating animals that may have been exposed between the farm and the packing plant.

Testing this new system is Norman W. Hooven, an ARS livestock identification specialist at Beltsville, Md. Mr. Hooven has been implanting small Teflon markers in the ears of calves with the same gun used to implant capsules of stilbestrol, a growth-promoting hormone.

Each marker can carry up to 20 letters and numbers. This permits a widely adaptable coding system for identifying an animal according to year of birth, herd, county, State, etc., without duplicating any numbers or letters.

Mr. Hooven explains that Teflon is inert and nontoxic to man and animals. Moreover, it does not damage the knives or other cutting implements used in packing and rendering plants. And the markers do not migrate from the site of implantation, an important factor in recovering them.

In August 1968, Mr. Hooven implanted 100 Hereford-Charolais crossbred cattle at the U.S. Meat Animal Research Center, Clay Center, Nebr. They were slaughtered in July 1969 to evaluate the markers for ease of implantation, percent of retention in the ear, and ease of recovery in the packing plant. To be worthwhile, recovery of the marker should not upset a packing plant's routine.

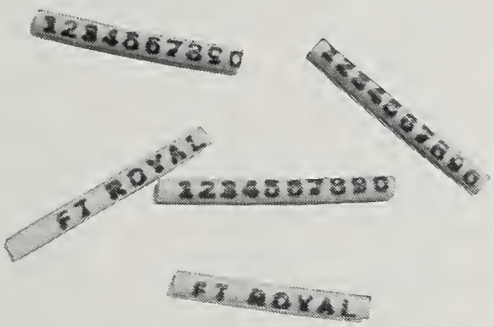
After each steer was slaughtered and hung on a rail, the ear containing the implant was severed, placed in a plastic bag, and attached to the brisket.

As the carcass moved along the rail, it was inspected at various points for wholesomeness. Carcasses suspected of being diseased were diverted to another rail for closer observation. Should the carcass be condemned, the inspector would record the data taken from the recovered implant.

None of the carcasses in this experiment was condemned, but all the implanted ears were studied. Ninety-two percent of the markers could be located by palpation; of these, 90 percent were visible under the skin.

Retention rate of the markers was 79.3 percent, compared with 93 percent in a previous study. Mr. Hooven thinks the lower retention rate relates to replacement of lost ear tags, many of which were inserted near the implant. This can break the encapsulation around the marker, allowing it to slip from the ear. Legibility of recovered markers was 100 percent. Apparently, tissue fluids did not adversely affect markers.

Mr. Hooven has implanted another 100 head of cattle to try to improve the retention rate of the markers. He thinks the system has a future—if a retention rate of 95 percent can be attained.■

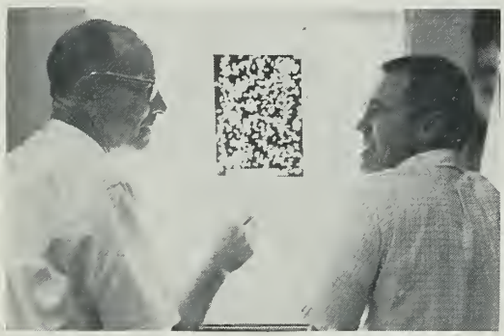


Left: Implants are 5/8 inch long and 3/32 inch in diameter. The flexible, yellow markers are not affected by body tissues (ST–4535–10). ***Below:*** *Implant is placed in hollow at base of calf's ear (ST–6831–18).*





Right: Composite of the X-rays of six seeds shows: Top line: Seed cracked underneath; seed cracked on the side; good seed. Bottom line: Seed 50-percent filled; seed 75-percent filled; good seed (PN–1877). ***Below:*** *Mr. Turner and Mr. Ferguson review the classification of seed. Backlighted box provides ideal means for examining each seed for cracks and degree of fullness (PN–1876).*



X-RAYS expose damaged cottonseed

A METHOD for identifying cracked and underdeveloped cottonseed may help solve a major problem confronting seed producers.

Cotton growers, striving for completely mechanized production, need high-quality seed capable of good emergence and vigorous seedling growth. Damaged and underdeveloped (partially filled or empty) seed that won't germinate properly under adverse conditions such as low temperature at planting time is both unproductive and costly.

Currently, the California Planting Cotton Seed Distributors determines the percentage of cracked seedcoats by visually examining seeds that have been ginned, then delinted with acid. Seed lots showing over 12-percent cracking are rejected for planting.

Detection of underdeveloped seed is practiced only by research and educational establishments. They use a "floater-sinker" method. Ginned, delinted seed samples are placed in water, where the good seeds sink and underdeveloped ones float. The percentage of floaters in the sample determines unsatisfactory seed lots.

ARS agronomists John H. Turner and David L. Ferguson developed an X-ray photography technique, however, that permits rapid and accurate identification of both conditions in a single operation. The agronomists are stationed at the U.S. Cotton Research Station, Shafter, Calif.

Their method consists of exposing samples of seed cotton, ginned seed, or delinted seed for 2 minutes on a sheet of film in a small, relatively inexpensive X-ray machine. After processing, the film negative is placed on a backlighted box with a frosted glass top where cracked and partially filled seeds can be counted in about 6 minutes.

Seed producers can obtain reliable estimates on the content in seed lots of cracked and underdeveloped seeds at costs equal to or lower than current methods used for detecting only cracked seeds. The lower cost is realized primarily in the saving of labor and time because seed samples can be readily X-rayed without first ginning or delinting.

The method can also be used by researchers to determine seed development in genetic and cultural field experiments.■

SEEPAGE METER REMODELED

As much as a third of the water leaving Western reservoirs en route to irrigated fields is lost through seepage. Moreover, 90 percent of this loss could occur in as little as 10 percent of the area of the canal or pond.

An improved seepage meter developed in Idaho can define these high-loss areas and give a reasonable estimate of the quantity of water being lost in specific canals or parts of canals, laterals, or ponds. These seepage points can then be lined or treated to reduce water loss at considerably less cost than lining the entire system.

Increasing land and water values as well as more intensive farming are making seepage control more and more important to farmers and irrigation districts, says ARS agricultural engineer Robert V. Worstell of Kimberly, Idaho, who developed the meter. Mr. Worstell has taken the best of other meters and added a few innovations to make a "new" meter that is faster, more portable, and more economical to operate. He is working in cooperation with the Idaho Agricultural Experiment Station.

A seepage meter consists of a bell or chamber—with its own measurable water supply—placed on the bottom of a canal or pond to note the rate of water loss at that point. Because the chamber must be well sealed to the canal or pond bottom, Mr. Worstell's meter employs a removable cover that is open to eliminate pressure inside the chamber while the meter is positioned.

After the chamber has been sealed and the cover closed, an inverted U-shaped manometer is used to test the seal. The manometer is a pressure gage made of two parallel, vertical plexiglass tubes joined with a fitting at the top. Plastic hoses are connected to the bottom of each tube, one going to the chamber and the other to the water surrounding the chamber. When suction is applied to the fitting at the top, both tubes fill with water which is lowered to about halfway by allowing air to enter at the top. If the system is properly sealed (and seepage is occurring), the manometer will indicate decreasing pressure inside the chamber as compared to the pressure outside.

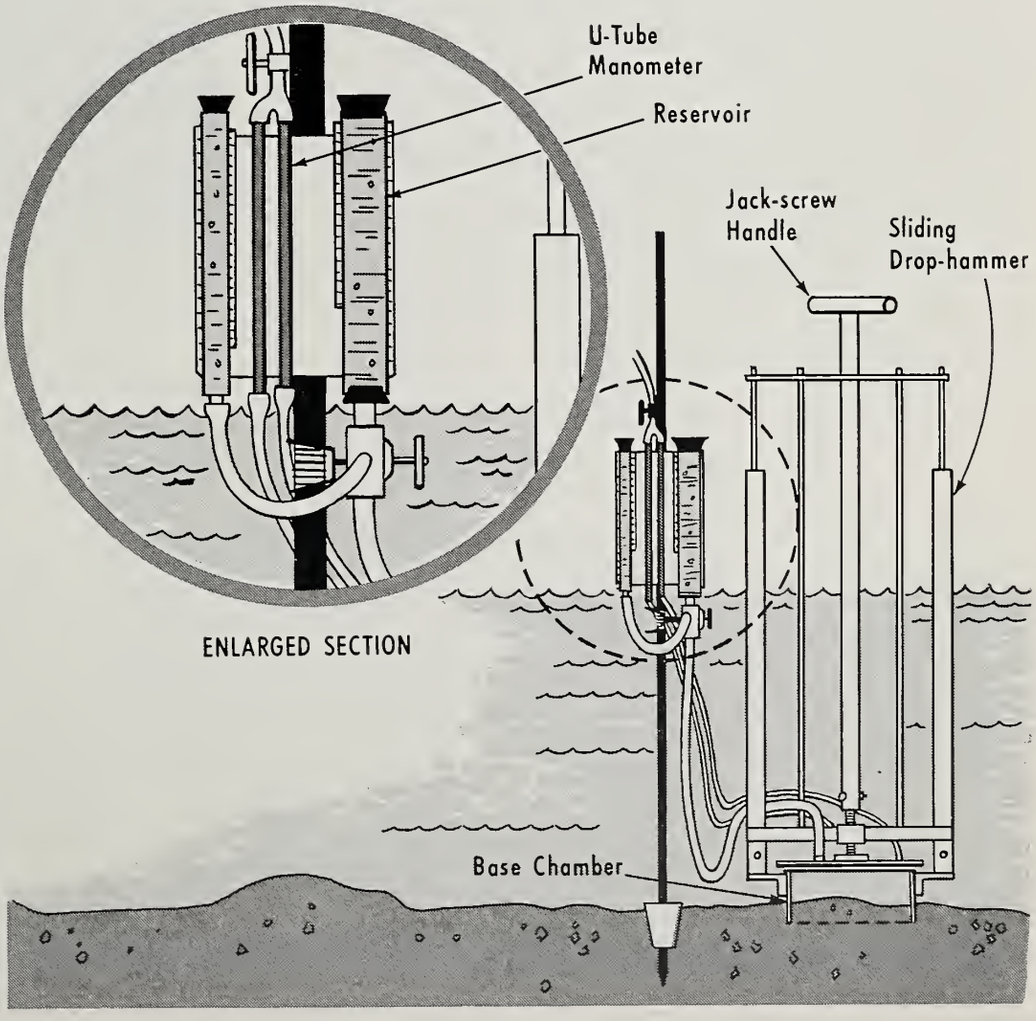
Once the seal is satisfactory, a plastic reservoir mounted next to the manometer, filled with water and sealed at the top, is switched with a valve to supply water to the chamber.

The manometer and reservoir slide up and down a steel rod driven into the bottom of the canal. With the reservoir and manometer connected to the chamber, pressure inside and outside the chamber can be equalized by raising or lowering the panel to have the same head of water pressure in the reservoir as is in the canal.

When the reservoir is disconnected, the seepage loss rate can be determined from a reading scale on the side of the reservoir and the use of a simple graph.

One man can operate the meter, and it can be used on the sides as well as the bottom of operating canals throughout the irrigation season.■

The sliding drop-hammers are used to set chamber base into canal bottom, and the jack-screw handle opens and closes the chamber cover (PN–1878).



Distinguished and Superior Service Awards

FOR THEIR OUTSTANDING accomplishments, 13 individuals and one group of ARS employees recently received Distinguished and Superior Service Awards. Secretary of Agriculture Clifford M. Hardin presented the awards at USDA's 24th annual awards ceremony held May 19 at Washington, D.C.



Dr. Anderson (ST–4843–9).



Dr. Benerito (PN–1879).



Dr. Sprague (BN–32552).

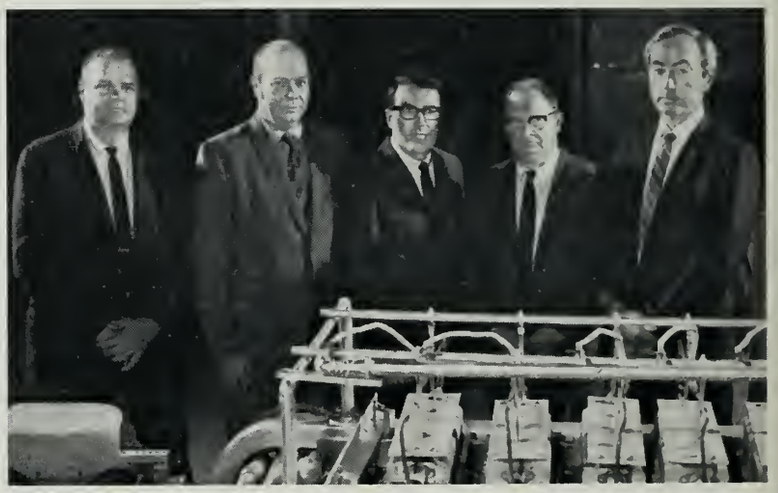
FOR DISTINGUISHED SERVICE

Dr. Robert J. Anderson, *Associate Administrator* (retired), for increasing the efficiency of U.S. agriculture and the safety of its food while achieving effective control of agricultural pests and diseases.

Dr. Ruth R. Benerito, *Southern utilization laboratory*, for research in physical chemistry and application of fundamental principles to solving research problems.

Dr. George F. Sprague, *Crops*, for creative research in plant breeding and genetics and foresighted leadership of corn and sorghum improvement programs.

WURPEEL Unit, *Western utilization laboratory*, for the conception, development, and extension to commercial use of a new peeling process that reduces by 75 percent the water pollution caused during potato processing.



WURPEEL Unit: Dr. Weaver, Dr. Huxsoll, Mr. Hart, Mr. Graham, Dr. Morgan, Jr. (PN–1880).

FOR SUPERIOR SERVICE

Dr. George E. Bohart, *Entomology*, for pioneering research in wild bee management which has greatly improved commercial alfalfa seed production and established a new entomological industry.

Mr. Alfred L. Everett and Dr. Irwin H. Roberts, *Eastern utilization laboratory* and *Animal Disease and Parasite*, for determining the cause and prevention of cockle defect in sheepskins, a costly problem.

Dr. Vincent P. Maier, *Western utilization laboratory*, for imaginative research in discovering the mechanism of delayed bitterness in citrus juices and identifying the enzyme system that prevents bitterness in whole fruit.

Mr. Lawrence W. Modlin, *Crops*, for superior production and effectiveness in the administration of Division fiscal and personnel affairs.

Mr. Robert B. Rathbone, *Information*, for improving communications with scientists, educators, consumers, and the general public; and for instituting efficient management and personnel practices.

Dr. Thomas R. Richmond, *Crops*, for improving knowledge of cotton genetics and breeding through personal research, leadership of a research team, and coordination of a regional research project.

Dr. Henry T. Skinner, *Crops*, for dignified scientific leadership that has brought the U.S. National Arboretum to its preeminent position of national and international influence in ornamental horticulture.

Dr. Russell L. Steere, *Crops*, for conceiving a radically new technique for preparing specimens for electron microscopy, and for developing equipment for its use in research.

Dr. Raymon E. Webb, *Crops*, for unique and effective contributions to vegetable research and for leadership in variety improvement and biological pest control.■

Insect Research Lab Dedicated

ARS recently dedicated one of the world's most modern facilities for research on combating insects in stored foods, feeds, fabrics, and other products.

The new $800,000 building will serve as headquarters for the Stored-Product Insects Research and Development Laboratory, which consists of 12 buildings on a 10-acre site in Savannah, Ga. Approximately 70 scientists and supporting staff are stationed at the laboratory.

Along with attempting to improve conventional pest control methods, the researchers will explore potential new methods such as the use of atomic radiation, light, sound, atmospheric gases and other physical phenomena. And basic studies of insect behavior, glands, and internal processes may suggest other new or better techniques.

Experimental nontoxic treatments for mothproofing woolens will also be developed, and insect-resistant packaging methods and materials will be tested against the most important pests of stored products.

In addition to the Savannah facility, ARS scientists at seven other laboratories are studying ways to combat insects that cause losses in stored products exceeding $850 million annually. Farmers, consumers and business firms spend more than $280 million annually for control.

Controlling Dodder in Alfalfa

Two new pesticides are more effective for full-season control of dodder in alfalfa than chlorpropham—the standard herbicide now used.

Chlorpropham (isopropyl *m*-chlorocarbanilate) gives effective initial control of dodder but does not control late-germinating dodder because the chemical is rapidly lost from the soil. Full-season control is needed, however, since producers are prohibited from selling alfalfa seed contaminated with noxious weed seed.

ARS agronomist Jean H. Dawson, in cooperation with the Washington Agricultural Experiment Station, Prosser, compared the effectiveness of the herbicide RH-315 [*N*-(1,1-dimethylpropynyl) - 3,5-dichlorobenzamide] with chlorpropham and chlorpropham plus PCMC (*p*-chlorophenyl *N*-methylcarbamate). PCMC is a microbial inhibitor nontoxic to plants.

In greenhouse experiments, chlorpropham at 6 pounds per acre (ppa) controlled dodder for 4 weeks. However, the weed was controlled 9 weeks with a mixture of 6 ppa of chlorpropham plus 1.5 ppa of PCMC, and 12 weeks with RH-315 at 1.5 ppa.

In the field, satisfactory control—that is, a 95 percent or more reduction of dodder clinging to alfalfa—was obtained from chlorpropham alone on early emerging dodder. But the chemical failed to adequately control dodder during the second emergence.

RH-315 at 1.5 ppa provided 96- to 100-percent control of both early- and second-emergence dodder. And the chlorpropham-PCMC mixture at 6 ppa and 1.5 ppa respectively provided 97- to 100-percent control.

This use of RH-315 and PCMC is experimental and is not yet registered by USDA. Further tests will include determination of safety.

The new stored-product insects laboratory in Savannah, Ga. (*BN–35627*).



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AGRISEARCH NOTES

Kenaf Makes It in Trial Run

The first industrial-scale trial of kenaf in paper demonstrated not only the potential of this annual plant as a pulping crop but also the interest of paper manufacturers in developing it.

Bond paper was manufactured from the pulp on a paper machine housed at ARS' Northern utilization research laboratory, Peoria, Ill. Witnessing the run was the Nonwood Plant Fibers Committee of the Technical Association of the Pulp and Paper Industry, which plans to use the bond for committee letterheads.

This was the group's first meeting since organizing as a permanent industrial committee in March 1969. The 13 committeemen came from Peru, El Salvador, and seven States to observe the kenaf bond run. Six of them represented paper or machinery companies. ARS chemical engineer Thomas F. Clark, fibrous products investigations head at the Northern laboratory, is committee secretary. Dwight L. Miller, assistant laboratory director, is a member.

The bond, 40 percent kenaf and 60 percent hardwood-softwood, has strength properties comparable to those of an all-wood bond used as a control. However, the kenaf bond contains small amounts of materials foreign to the kenaf-wood pulp that blemish the bond's whiteness.

The foreign matter does not reflect on the kenaf or the processing. It was introduced during the long, step-by-step handling and transporting from harvest to experimental processing. The kenaf had been grown in 1968 at Glenn Dale, Md.; pulped at Toledo, Ohio; bleached at Madison, Wisconsin; and stored at Peoria before final processing and papermaking.

Teat Canals and Udder Infections

The wider the canal at the end of a cow's teat, the more susceptible the cow is to udder infection.

This observation was made by ARS veterinarian John S. McDonald, National Animal Disease Laboratory, Ames, Iowa, who studied five cows through five lactations. He noted that in the test cows the length and diameter of the teat canal increased with each lactation. As canal diameter increased, so did the incidence of infection—but an increase in the *length* of the teat canal appeared to have no effect.

To study changes in teat canal diameter, Dr. McDonald injected a suspension of barium sulfate into the teat canal and lower teat sinus. He then attached a piece of dental X-ray film to the teat so that a negative image of the teat canal was produced on the film when the teat was X-rayed.

Observations on groups of dairy cattle also revealed a great variation in teat canals. Some heifers had narrow teat canals which never dilated, but other heifers developed wider teat canals with each lactation. Also, diameter of the canal may vary in different quarters of the same udder.

Heifers born with wide teat canals may, before freshening, have udder infection, which, if cleared up, may return during lactation. Dr. McDonald cleared up the infection in one cow several times, only to have new infection appear during each lactation. As cows become older, the pattern—higher incidence of infection as test canal widens—appears.

Though cows with narrow teat canals suffer less from udder infection, they are harder to milk because the restricted canal inhibits milk flow. Conversely, cows with wide canals are easy milkers and can be milked out more quickly, both economical advantages to the dairymen.

To prevent infection, Dr. McDonald stresses the need for dipping all teats in a disinfectant solution after each milking (AGR. RES., Jan. 1970, p. 12).

Further studies are underway to determine if, as is suspected, teat canal width is inherited.

CAUTION: In using pesticides discussed in this publication, follow directions and heed precautions on pesticide labels. Be particularly careful where there is danger to wildlife or possible contamination of water supplies.



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